

## Claims

- [c1] 1. A flip-chip package substrate, comprising:  
a plurality of sequentially stacked wiring layers;  
at least one insulation layers between two neighboring wiring layers so that the insulation layer and the wiring layer are alternately stacked on top of each other; and  
at least one conductive plugs passing through the insulation layer for electrically connecting the wiring layers;  
wherein the uppermost wiring layer further includes:  
a plurality of core bump pads;  
at least one signal bump pad rings around the core bump pads;  
at least one power bump pad rings around the core bump pads; and  
at least one ground bump pad rings around the core bump pads;  
wherein the signal bump pad rings, the power bump pad rings and the ground bump pad rings are distributed concentrically; and  
the bottommost wiring layer further includes:  
a plurality of core ball pads;  
at least one signal ball pad rings around the core ball pads;  
at least one power ball pad rings around the core ball pads; and  
at least one ground ball pad rings around the core ball pads;  
wherein the signal ball pad rings, the power ball pad rings and the ground ball pad rings are distributed concentrically.
- [c2] 2. The flip-chip package substrate of claim 1, wherein the core bump pads includes a plurality of core power bump pads and a plurality of core ground bump pads.
- [c3] 3. The flip-chip package substrate of claim 2, wherein the core power bump pads and the core ground bump pads are alternately positioned.
- [c4] 4. The flip-chip package substrate of claim 2, wherein the core power bump pads are grouped together to form at least one core power bump pad rings, the core ground bump pads are grouped together to form at least one core ground bump pad rings and both the core power bump pad rings, and the core ground

2090907904061

bump pad rings are distributed concentrically.

- [c5] 5. The flip-chip package substrate of claim 1, wherein the core ball pads includes a plurality of core power ball pads and a plurality of core ground ball pads.
- [c6] 6. The flip-chip package substrate of claim 5, wherein the core power ball pads and the core ground ball pads are alternately positioned.
- [c7] 7. The flip-chip package substrate of claim 5, wherein the core power ball pads are grouped together to form at least one core power ball pad rings, the core ground ball pads are grouped together to form at least one core ground ball pad rings and both the core power ball pad rings, and the core ground ball pad rings are distributed concentrically.
- [c8] 8. The flip-chip package substrate of claim 1, wherein the signal bump pad ring encloses a plurality of bump pads over 50% of which are signal bump pads.
- [c9] 9. The flip-chip package substrate of claim 1, wherein the power bump pad ring encloses a plurality of bump pads over 50% of which are power bump pads.
- [c10] 10. The flip-chip package substrate of claim 1, wherein the ground bump pad ring encloses a plurality of bump pads over 50% of which are ground bump pads.
- [c11] 11. The flip-chip package substrate of claim 1, wherein the signal ball pad ring encloses a plurality of ball pads over 50% of which are signal ball pads.
- [c12] 12. The flip-chip package substrate of claim 1, wherein the power ball pad ring encloses a plurality of ball pads over 50% of which are power ball pads.
- [c13] 13. The flip-chip package substrate of claim 1, wherein the ground ball pad ring encloses a plurality of ball pads over 50% of which are ground ball pads.
- [c14] 14. A flip-chip package substrate, comprising:  
a plurality of sequentially stacked wiring layers;  
at least one insulation layers between two neighboring wiring layers so that the insulation layer and the wiring layer are alternately stacked on top of each

other; and

at least one conductive plugs passing through the insulation layer for electrically connecting the wiring layers;

wherein the bottommost wiring layer further includes:

a plurality of core ball pads;

at least one signal ball pad rings around the core ball pads;

at least one power ball pad rings around the core ball pads; and

at least one ground ball pad rings around the core ball pads;

wherein the signal ball pad rings, the power ball pad rings and the ground ball pad rings are distributed concentrically.

[c15] 15. The flip-chip package substrate of claim 14, wherein the core ball pads includes a plurality of core power ball pads and a plurality of core ground ball pads.

[c16] 16. The flip-chip package substrate of claim 15, wherein the core power ball pads and the core ground ball pads are alternately positioned.

[c17] 17. The flip-chip package substrate of claim 15, wherein the core power ball pads are grouped together to form at least one core power ball pad rings, the core ground ball pads are grouped together to form at least one core ground ball pad rings and both the core power ball pad rings and the core ground ball pad rings are distributed concentrically.

[c18] 18. The flip-chip package substrate of claim 14, wherein the signal ball pad ring encloses a plurality of ball pads over 50% of which are signal ball pads.

[c19] 19. The flip-chip package substrate of claim 14, wherein the power ball pad ring encloses a plurality of ball pads over 50% of which are power ball pads.

[c20] 20. The flip-chip package substrate of claim 14, wherein the ground ball pad ring encloses a plurality of ball pads over 50% of which are ground ball pads.

2025-10-20 10:10:10